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MODERNIZING
THE HOT WATER
HEATED HOME
with *Sav-T-heat*
AND
AIR CONDITIONING
by
DUNHAM

MASTER CRAFTSMEN OF THE HEATING INDUSTRY

PHILADELPHIA

EVERY OCCUPANT OF A HOT WATER HEATED HOME MAY NOW ENJOY—

- the luxury and carefree comfort of gas fuel at an operating cost in many localities comparable to that of ordinary fuels. *Sav-T-heat* makes this possible.
- domestic hot water supply in winter heated by the same plant which heats the home. A further advantage of *Sav-T-heat*.
- the benefits of modern air conditioning. Clean, filtered air—warmed and humidified in winter, cooled and dehumidified in summer. The Dunham Air Conditioning Unit makes this possible.

A BRIEF DESCRIPTION

Sav-T-heat is a gas-burning appliance which replaces the present hot water boiler. It is made up of three essential parts — the generator, the economizer and the exhauster. The generator is much the same as the ordinary gas-burning boiler except that it is provided with a water jacket which is entirely separate from the heating system water passages. Water for this jacket, after once supplied, is maintained by the gas itself, which makes more than ample quantities. The water in this jacket vaporizes in the top of the generator and mixes with the products of combustion. The vapor-laden mixture thus formed is one which can very safely be reduced to very low temperatures, making it possible to extract the maximum heat quantity from the gases of combustion.

The economizer attaches to the top of the generator and is a secondary water heater. The water from the heating system passes through the economizer before entering the generator, and the partially spent gas mixture from the generator supplies heat to the economizer.

The exhauster is a little motor-driven unit which supplies the exact air quantity required for complete combustion; it also furnishes the necessary draft.

THE DUNHAM AIR CONDITIONING UNIT

is a very desirable but not a necessary addition to *Sav-T-heat*. Aside from the obvious advantage of supplying conditioned air, the conditioning unit utilizes what otherwise would be only the waste heat for tempering the air which passes through the unit. The gas mixture passes through the radiators in the conditioning unit before being discharged to the atmosphere by the exhauster.

C. A. DUNHAM COMPANY

450 EAST OHIO STREET, CHICAGO

REPRODUCED BY THE
AMERICAN INSTITUTE



Sav-T-heat

without the
Air Conditioning Unit

Sav-T-heat BURNS NATURAL OR ARTIFICIAL GAS

Of all the commercial fuels, gas alone meets every requirement for 100 per cent automatic heating and air conditioning. It is clean—burns without smoke, ash or residue. It is always instantly available and is subject to perfect control. No fuel storage space is required and no investment in fuel is necessary. It is paid for only as it is used. It burns without noise or odor. It is *the* ideal fuel for the home.

THE COST OF GAS FUEL

Many think of gas fuel as a luxury. A few years ago it was. So were electric light, radio and telephone. These are commonplace conveniences today, and gas fuel is rapidly pushing itself into that classification. Gas rates for home heating today are universally lower by far than they were a few years ago. Natural gas is piped to cities hundreds of miles from the gas fields. An outlet is being provided for millions of cubic feet of gas where none existed before. Artificial gas-producing facilities are being increased, with corresponding increases in production efficiency. Increased production and distribution lower costs, and the rates go down.

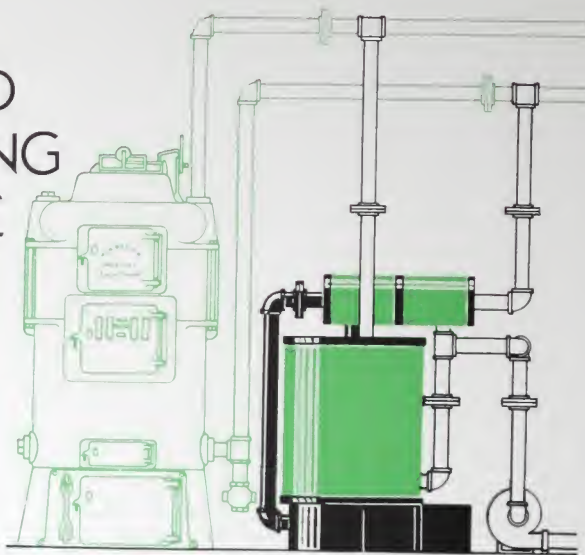
Gas-burning appliances have kept pace by steadily increasing efficiencies, converting more of the heat in the fuel into useful heat. The *Sav-T-heat* of today will extract twice as much heat from a given amount of fuel as would what was considered a good appliance of a few years ago. In some cities, at least, the combination of low gas rate and the efficiency of *Sav-T-heat* bring to you this last word in heating convenience at an operating cost comparable to that of the ordinary heating system.

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Sav-T-heat

MAY BE INSTALLED WITHOUT DISTURBING ANYTHING ABOVE THE BASEMENT

The installation of *Sav-T-heat* in the existing hot water heated home is simplicity itself. The only part of the existing heating system which is disturbed in any way is the piping system at the point where *Sav-T-heat* connects to the existing hot water mains. At the option of the owner, the existing boiler can be removed or left in place. If desired, the existing boiler can be cross-connected to *Sav-T-heat*, so that either is available for service.



Sav-T-heat connects to the present hot water mains

NO CHIMNEY IS REQUIRED FOR **Sav-T-heat**

Sav-T-heat is in no way dependent on natural draft. If a chimney flue is available, the gases from *Sav-T-heat* exhauster are usually discharged into this flue. The size of the flue or the condition of the flue as regards the draft it normally creates is of no consequence. It is not necessary to locate *Sav-T-heat* with reference to chimney location, even though the gases are to be discharged into the flue. If a chimney is not available, *Sav-T-heat* gases can be discharged through an ordinary steel pipe such as is used to convey water through the heating system.

COMPLETELY AUTOMATIC

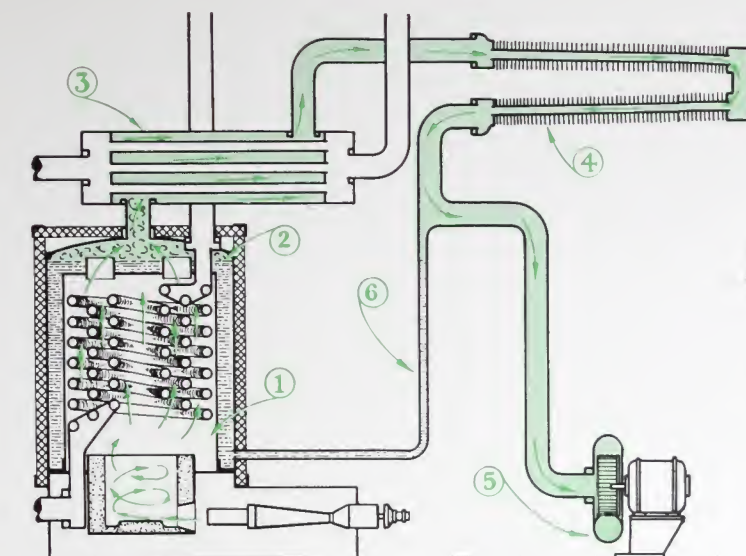
The extent of the attention which *Sav-T-heat* requires is briefly this: The water jacket and the humidifier pan must be filled to the overflow level; motor bearings should be oiled once a year; a match to the pilot light, and *Sav-T-heat* does the rest. The thermostat completely governs the entire plant and maintains the desired temperature through all of the heating season. There is nothing to watch, nothing to adjust. Through the chill of fall and spring, and the intense cold of winter, *Sav-T-heat* supplies just the correct amount of heat to maintain the temperature.

The Dunham Air Conditioning Unit is equally trouble-free. Oil in the bearings once a year, and it operates in step with *Sav-T-heat*, sending its stream of thoroughly cleansed humidified air throughout the home.

Sav-T-heat CONTROLS

Only the very finest of proved, time-tested controls are used on *Sav-T-heat*. Everything is automatic. Nothing is left to chance. The main gas supply closes instantly in case of failure of any part of the apparatus. This even extends to the point where the gas supply to the pilot light closes in case the pilot light is not burning. This measure of extreme care in the application of positive safety controls is not usually found in gas-burning appliances.

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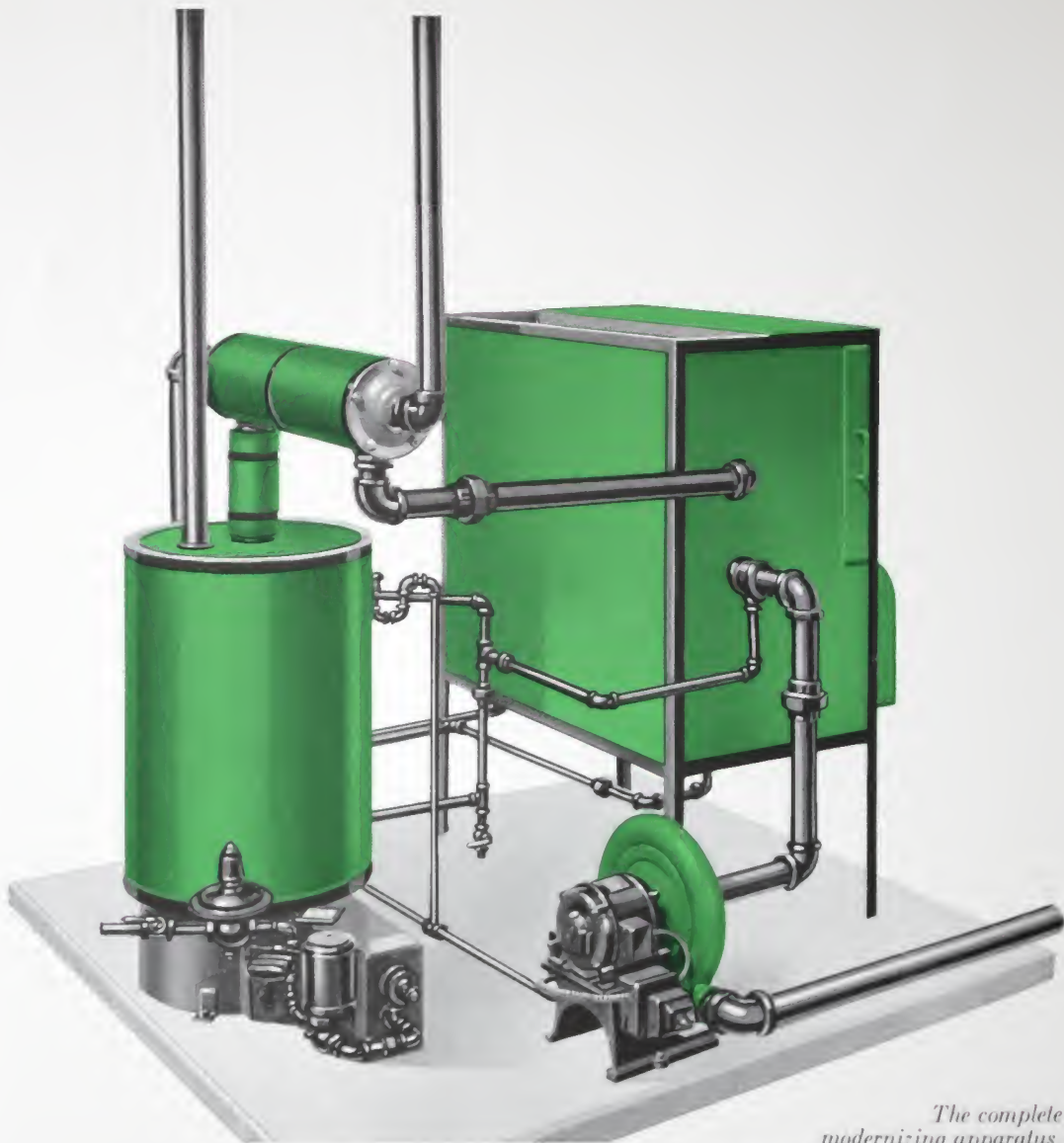


FOLLOW
THE
HOT GASES
THROUGH
Sav-T-heat

See how every available heat unit is extracted before the gases are exhausted.

- 1 . . This is the generator in which the gas is burned. A large percentage of the heat is quickly extracted by the coils of pure copper, through which the water in the heating plant circulates. The water in the jacket which surrounds the combustion chamber is entirely separate from the water in the heating system. All of this water is taken from the gas itself, which contains more than ample quantities to form a correct heating mixture.
- 2 . . The real secret of *Sav-T-heat* is here in the top of the generator. Here the gases of combustion mix with water vapor generated from the water in the jacket. The mixture thus formed is high enough in vapor content to completely eliminate any possibility of abnormal corrosion, which sometimes takes place when gases are reduced in temperature to that at which the moisture condenses. The added moisture tends to wash away toward a draining overflow all impurities in the system, and dilutes the condensation to such an extent that there is no concentration of harmful substance.
- 3 . . The gas mixture now enters the economizer. This is a secondary water heater, through which the water in the heating system circulates before entering the coils in the generator. The heating surface in the economizer is much more effective than the same amount of surface would be if added to that in the generator. The reason is that only the *coolest* water in the heating system enters the economizer, and the gas mixture will impart more of its heat because of the greater difference in temperature.
- 4 . . When the gas mixture leaves the economizer, it is already lower in temperature than that of stack gas in the ordinary appliance, but some useful heat remains. The gases now enter the first radiator section in the Dunham Air Conditioning Unit. They then continue on to the second radiator section, giving up enough more heat to provide the necessary warmth to temper the air which passes through the conditioning unit.
- 5 . . From here the gases finally pass to the little motor-driven exhaustor and are discharged to the atmosphere at a temperature considerably *lower* than that of the water in the heating system.
- 6 . . The water which is condensed out of the gas mixture returns to the generator water jacket through this return pipe.

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*The complete
modernizing apparatus,
consisting of **Sav-T-heat** and
the Dunham Air Conditioning Unit*

In keeping with the modern trend, both units are finished in a pleasing shade of green enamel, trimmed in jet black. *Sav-T-heat* shell and combustion chamber are built of heavy, durable, rust-resisting alloys. Castings are built of the highest grade of furniture steel. The *Sav-T-heat* generator and economizer are thoroughly insulated between the casing and the shell.

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EFFICIENCY

WHAT IT MEANS TO THE MAN WHO PAYS THE FUEL BILL

In the final analysis, efficiency is the measure of a gas-burning appliance. *Sav-T-heat* is not an outstanding product because it is fully automatic in operation. We are justified in expecting that of any good gas-burning appliance. It is clean; of course it is clean; why shouldn't it be when the fuel burns without smoke, ash or residue? These and many others are inherent advantages of the fuel. Efficiency, however, is something which must be built into the appliance.

Reference is made to an appliance as being 60 per cent efficient, or 70 per cent or 80 per cent. What does it mean? It means that, under *some* set of fixed conditions, the appliance converts that percentage of the available heat in the fuel into useful heat. Accurate efficiency data come from the laboratory, where performance can be accurately measured and fixed conditions maintained. Laboratory efficiency, however, is not *actual operating efficiency*. It is not necessarily an index to operating efficiency. The relation between laboratory and operating efficiency depends largely on how closely the conditions under which the laboratory test was made can be maintained in daily operation.

This is *not* a criticism of laboratory test procedure. For over four years *Sav-T-heat* has been in almost continuous operation in the laboratory. *Sav-T-heat* has developed the truly remarkable laboratory efficiency of over 90 per cent, but these tests were not conducted for the purpose of establishing a record laboratory efficiency. The purpose of the tests was, first, to establish the conditions under which maximum efficiency could be obtained and, second, to devise means of duplicating the conditions in actual practice as far as possible, giving due consideration to certain variables which are known to exist.

We firmly believe that, in actual operation, *Sav-T-heat* efficiency will more nearly approach laboratory efficiency than will any similar piece of apparatus. This statement is based on reason and logic, and facts are presented to support it. Study the principle on which *Sav-T-heat* operates; note the provisions for maintaining fixed draft; note that there is no flow of chilling air through the heater when the burner is not lighted; follow the course of the hot gases through the apparatus to the point where they are exhausted at a temperature *lower* than the water which is being heated. These things make for *operating efficiency*, and operating efficiency determines the size of the fuel bill.

Sav-T-heat DRAFT IS ALWAYS THE SAME

An essential to proper combustion is a fixed relationship between gas and air supply. When the air supply is obtained by means of natural draft it is certain to vary. Draft varies in different buildings and on different days in the same building. The *Sav-T-heat* exhauster supplies air to the burner in exactly the correct amount on any day and in any building. It is not affected by winds or by faulty chimney construction. This little motor-driven unit consumes only as much current as an ordinary electric light, and is in operation only when the main gas burner is lighted.

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EFFICIENCY

NO HEAT LOSS BY DRAFT WHEN BURNER IS OFF

The exhauster which induces the proper air flow through *Sav-T-heat* stops shortly after the thermostat shuts off the gas burner. There is therefore no movement of chilling air through the appliance when the burner is not in operation. Thus the combustion chamber retains its heat between firing periods — another reason for the high efficiency of *Sav-T-heat*: no heat is wasted in rewarming the apparatus when the thermostat again calls for heat.

WARMTH — NOT HEAT

There is a decided difference.

Sav-T-heat does not alter the comfort you have always enjoyed from low-temperature hot-water heating. Neither does the Air Conditioning Unit bring the air into contact with extremely hot surfaces which tend to carbonize dust particles in the air. The temperature of the gases in the air-conditioning radiators is always below the boiling point of water, and the air therefore is mildly tempered rather than "heated."

THE COMBUSTION APPARATUS

In distinct contrast to the burners used heretofore in gas-heating appliances, *Sav-T-heat* utilizes an entirely new and more efficient method.

The raw gas, and the proper amount of air for its complete combustion, pass through a Venturi-shaped tube, and there become thoroughly mixed. Thorough mixing is one of the essentials to obtain complete combustion, with the resultant temperatures higher than those found in the usual atmospheric type of burner. As the impregnated gas leaves the tube it is ignited, and enters the refractory as a flame.

The refractory, here illustrated, is built of the finest fire clay in order to withstand the high temperatures of the burning gas. It will be noted that the flames enter the circular chamber at the bottom of one side, and thus are compelled to take up a slowly rising rotary motion, lengthening the travel of the actual flame in the red-hot refractory and insuring the completion of the combustion in the chamber itself.

After leaving the refractory, the hot gases pass up around the tubes carrying the hot water for the heating plant, and along the sides and top of the inner chamber, beginning their travel through the system, as explained on page 5, until every possible heat unit has been extracted for use in heating and conditioning the home.





HEATING THE DOMESTIC WATER SUPPLY IN WINTER

Until the advent of *Sav-T-heat* there was no practical method of heating domestic water direct from the ordinary hot water heating plant. The only method which was in any measure satisfactory was that of placing a coil or heater in the firebox of the boiler. If this coil was made large enough to provide a sufficient supply of hot water in mild weather, it was too large in cold weather when the heating plant was in operation for longer and more frequent periods. It could not be controlled, because the water in the coil would boil if any attempt were made to limit its output.

The problem in the steam or vapor heated home is comparatively simple. The temperature of the water in the boiler being so much higher than that in the hot water plant, domestic water can be circulated through a heater to which heat is imparted by the water in the boiler.

Sav-T-heat employs exactly the same principle. The temperature of the water in the jacket which encloses the combustion chamber is practically the same as that in a vapor heating system boiler. Exactly the same sort of domestic water heater can be used with the same degree of satisfaction. This heater can be made large enough to supply a sufficient quantity of domestic water in mild weather with no danger of excessive water temperature in cold weather. The temperature of the water can be controlled by a valve which limits the circulation of water from the *Sav-T-heat* jacket. The domestic water heater is not a part of *Sav-T-heat*, but tapings are provided to which any standard heater of this type may be connected.

THE HUMIDIFYING APPARATUS

Simplicity is the keynote of the Dunham humidifier, which is furnished as a part of the Air Conditioning Unit. A water pan is located in the Air Conditioning Unit in such a way that the air comes into intimate contact with the surface water in this pan. The water level is automatically maintained by a simple water feeder which connects to the city water main. In order to insure ample humidification, the water in this pan is heated by circulating through a heater coil in the firebox of *Sav-T-heat*.

The humidifier is practically automatic in operation, eliminating the necessity of separate humidity control apparatus. The amount of moisture which must be added to the air in winter months varies closely with the outside temperature. Inasmuch as the water supply for the humidifier will be heated only when *Sav-T-heat* is in operation, more moisture will be added to the air as the outdoor temperature drops and the heating demand increases.

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THE DUNHAM AIR

A GENERAL DESCRIPTION

The Dunham Air Conditioning Unit incorporates everything necessary to provide maximum comfort in the home. Two fully housed double-width blowers are located in the unit and are V-belt-driven by a small motor which is mounted in such a way that the belt is always in proper tension. Every possible precaution has been taken to insure quiet operation. The blowers are designed for slow-speed operation, and rubber and felt insulation is provided throughout.

The filter sections are mounted in a drawer of the Air Conditioning Unit. The filter material is glass wool, every strand of which has been coated with an adhesive substance which catches and holds the dust particles in the air. After months of service, the dust-laden filter sections are discarded and new sections installed. The cost is a negligible item and the dirty, messy job of filter cleaning is entirely eliminated.

The unit is provided with two large radiators of the latest copper-fin type instead of the customary single radiator unit. Excess radiation is furnished in order to provide maximum cooling effect in summer. The radiators are of the high-pressure type, tested to a pressure of two hundred pounds to the square inch.

The humidifying water pan extends the full length of the unit and is located immediately in front of the fan discharges. During the winter months a constant water level is automatically maintained in this pan and the water is heated by a coil located in *Sav-T-heat*. In the summer months the water supply to the humidifier is shut off, and the water in the pan is drained to the sewer. The pan then serves as a drip pan to catch water which is condensed out of the air by the cold radiators.

SELECTIVE FAN SPEED

A three-step pulley is provided on the fan and motor shafts, which makes it possible to operate the unit at any one of three speeds. The lowest speed is used during the winter months. During the summer, when some slight noise is not objectionable, and when more rapid air motion is necessary, the belt is changed to the pulleys which operate the fans at the higher speed. This change can be made in an instant, without tools.

CONDITIONING UNIT CAN BE INSTALLED AT ANY TIME

It is not necessary to install the air conditioning unit at the time the *Sav-T-heat* installation is made. Many people prefer to spread the investment over a period of more than one year. The conditioning unit can be installed at any time, and the cost will be practically the same as though the unit were installed at the outset.

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CONDITIONING UNIT

AIR CONDITIONING—

WHEN YOU WANT IT

WHERE YOU NEED IT

Although the Dunham Air Conditioning Unit is usually operated in step with the heating plant during the winter months, it is a separate unit. It is dependent on the heating plant only to the extent of obtaining a heat supply sufficient to temper the air slightly in winter in order to prevent objectionable drafts. If the conditioning unit supplied all of the required heat to the various rooms with air of the same temperature, the air supply to the different rooms would be fixed by the heating requirement rather than by the conditioning requirement. This would bring about a condition (not at all unusual) where more conditioned air would be supplied to some remote, infrequently used room than was being supplied to the living quarters.

The air supplied by the Dunham Air Conditioning Unit may be apportioned to the various rooms as the nature of the occupancy makes necessary, which usually means that practically all of the air is delivered to the living quarters.

It is not necessary to keep the Dunham Air Conditioning Unit in operation if the home is to be unoccupied for a few days. The heating plant will maintain the temperature, which is all that is necessary during that period.

COOLING IN SUMMER

During the summer months, cold water from the city water mains is circulated through the radiators in the conditioning unit. The water is never in direct contact with the air. Although air can be lowered in dry-bulb temperature by bringing it into direct contact with water, the comfort value of such cooling is very questionable. Under most conditions, the drop in temperature is accomplished at the expense of a much higher humidity. The Dunham unit will not increase the moisture content of the air; on the contrary, moisture will practically always be extracted from the air.

The extent of cooling and dehumidifying which is possible will depend, of course, on the condition of the air and the temperature of the water. Even when water is not available at temperatures low enough to effect appreciable cooling, the unit will always improve conditions by creating a pleasant air motion.

Mechanical refrigeration or ice can be used to cool the water supply to the Dunham Air Conditioning Unit, in which case the water supply is recirculated through the radiators. Artificial means of cooling can be added at any time after the unit is installed.



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